Ministry of Natural Resources

Northwestern Ontario Forest Technology Development Unit

Northwestern Ontario Boreal Forest Management

Technical Notes

TN- 15

1992

CRITICAL SILVICS OF LARGE-LEAVED ASTER AS RELATED TO VEGETATION MANAGEMENT

C. Hollstedt

INTRODUCTION

This technical note is designed to assist resource managers in developing site-specific vegetation management strategies. It follows the general format established by Bell (1991) and is one in a series of technical notes intended as addenda to the above mentioned document. Readers may wish to refer to Bell (1991) for background information.

DESCRIPTION

General: Large-leaved aster (*Aster macrophyllus* L.) is a perennial with creeping rhizomes, often forming dense patches of single-leaved, vegetative individuals; the height of large-leaved aster may vary from 0.2 to 1.5 m (Fernald 1950); flowering stems may reach 1 m in height and are usually hairy, with a short, woody base (Gleason 1958) (Figure 1).

Leaves: Leaves are alternate on the flowering stem; most commonly encountered as basal leaves of non-flowering individuals; basal leaves are very large (up to 20 cm long and 15 cm wide), firm, thick, usually hairy, coarsely toothed, tapering to a pointed tip, heart-shaped at the base, on long leafstalks without a fringe of fine hairs; upper stem leaves are reduced, essentially stalkless.

Flowers: Flowers form in a loose, open, flat-topped inflorescence with sticky hairs; individual flower heads are daisy-like, sparse, with 9-20 purple to pale blue rays; appearing in August.

Fruit: Fruit are small, linear seeds with fluffy, bristle-like hairs; forming a small dandelion-like ball for each flower head; appearing in late August to September.

Figure 1. Diagram of large-leaved aster.

Key diagnostic information was obtained from Baldwin and Sims (1989).

This project was funded in part by the sustainable forestry initiative.

VMAP
Vegetation Management Alternatives Program

Figure 2. Distribution of large-leaved aster in Ontario (Semple and Heard 1987).

HABITAT

Distribution in Ontario: Large-leaved aster is widespread throughout northwestern Ontario (Figure 2), frequently occurring across a broad range of forest habitats. It is common in woodlands and clearings (McKay and Catling 1979), and occurs throughout Ontario, except in the far north (Semple and Heard 1987).

Climate: Large-leaved aster is found across a wide climatic range from New Brunswick and Quebec to Wisconsin, and Minnesota (Gleason 1958). It is generally a species of cool temperate climates in eastern North America (Moyle and Moyle 1977).

Site and Soil Relations: This species occurs on dry to moist mineral soils (Figure 3a), often contributing to a dense herb/low shrub cover with wild sarsaparilla (*Aralia nudicaulis* L.), bush honeysuckle (*Diervilla lonicera* Mill.) and other species in fresh hardwood and mixedwood stands (Baldwin and Sims 1989). It forms almost continuous ground cover in rich, deep-soiled upland deciduous forests (Walshe 1980) and is one of the most commonly occurring species in even-aged jack pine (*Pinus banksiana* Lamb.) stands on upland sites (Kenkel 1986). Large-leaved aster is one of the most frequent and abundant species encountered in both cutover and old-field situations along with swamp aster (*A. puniceus* L.), ciliolate aster (*A. ciliolatus* Lindl.) and other aster species (Lehela 1991, pers. comm.).

Nutrient Requirements: Information on nutrient requirements was not available in the literature; however, based on Northwestern Ontario Forest Ecosystem Classification (NWO FEC) data (Sims *et al.* 1989), large-leaved aster prefers rich sites across a range of moisture gradients (Figure 3b).

Moisture Requirements: Large-leaved aster is found across a range of moisture regimes in open woodlands (Fernald 1950).

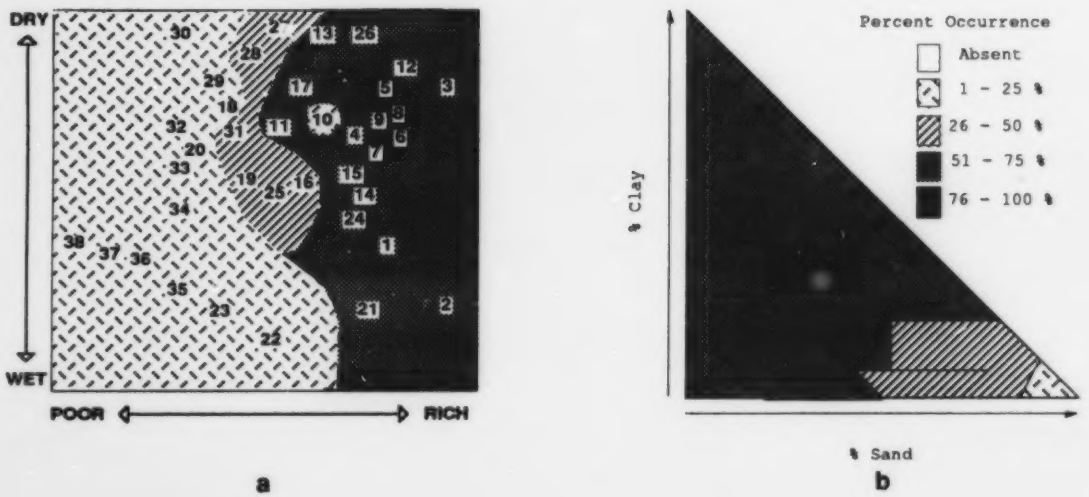

Figure 3. Percent occurrence of large-leaved aster in northwestern Ontario by a) NWO FEC vegetation type and b) soil texture.

Light Requirements: Large-leaved aster is shade tolerant, occurring as ground cover in pine forests (Ahlgren 1960; Ahlgren and Ahlgren 1981; Kenkel 1986). It also grows in the open.

REPRODUCTION

Sexual Reproduction: Seed production, dispersal, viability and germination of large-leaved aster are discussed.

Seed Production and Dispersal: Large-leaved aster is a perennial and produces seeds in the second year following establishment. It flowers in August and disperses its seeds in September, often on an annual basis (Baldwin and Sims 1989; McKay and Catling 1979). Small dandelion-type flower heads are wind disseminated in late August and September (Baldwin and Sims 1989).

Seed Viability and Germination Requirements: Seeds germinate better in red pine (*Pinus resinosa* Ait.) and white pine *(P. strobus* L.) litter than in paper birch (*Betula papyrifera* Marsh.), trembling aspen (*Populus tremuloides* Michx.) or balsam fir (*Abies balsamea* (L.) Mill.) litter (Ahlgren and Ahlgren 1981).

Vegetative Reproduction: Once established on a site, this species reproduces largely by vegetative means (Ahlgren 1960). Creeping rhizomes (Gleason 1958) result in many plants growing together in large patches producing leaves but no flowers (McKay and Catling 1979).

GROWTH AND DEVELOPMENT

Large-leaved aster is a perennial that grows from 0.2 to 1.5 m in height (Fernald 1950). Plants growing in less favourable habitats are shorter with small basal leaves; plants growing in more favourable sites are more than 1 m tall with 0.2 m long basal leaves (Semple and Heard 1987). Many plants often grow together in large patches (McKay and Catling 1979) producing leaves but no flowers. Plants that do flower produce seed in the second year following establishment.

PHENOLOGY

Root, Shoot and Foliage: Information regarding root, shoot and foliage phenology of large-leaved aster was not found in the literature.

Reproductive Structures: Large-leaved aster flowers from August through September (McKay and Catling 1979; Moyle and Moyle 1980; Walshe 1980). Flower heads appear in late August to September (Baldwin and Sims 1989).

RESPONSE TO DISTURBANCE

Overstory removal: Sutton (1964) found that large-leaved aster was stimulated to produce more seed in a cutover site than in an undisturbed forest, probably due to an increase in light. Large-leaved aster is one of the most frequent and abundant species in cutover situations (Lehela 1991, pers. comm.).

Fire: Large-leaved aster occurs on both burned and unburned sites. The underground vegetative portion of the plant is resistant to heat damage; however, when fire is severe and kills the vegetative parts, the site is recolonized by seed from adjacent sites (Ahlgren 1960, 1979). In one study, percent cover of large-leaved aster on a jack pine site was slightly reduced by fire (Anon 1970).

Mechanical Site Preparation: A study in north central Ontario, designed to determine how disturbance affects the occurrence of weed species, indicated that the frequency of *Aster* spp. increased from 0 stems/mil-acre in the control to 137 stems/mil-acre in an uncut stand scarified with a root rake, compared to 7.0 stems/mil-acre in the clearcut, unscarified stand (Campbell 1981; 1984). Brand (1991) found that large-leaved aster did not increase in density following blading. Berms created by trenching are not suitable habitats for aster species (Sidhu and Feng 1990).

Cutting: No information on the effects of cutting on large-leaved aster was found in the literature; however, Semple (1992, pers. comm.) noted that removing above-ground parts of large-leaved aster would stimulate rhizome activity and increase the density of plants.

Chemical Treatments: The response of large-leaved aster to 2,4-D, hexazinone, glyphosate and triclopyr is discussed separately.

2,4-D: This product is best suited to situations of rapid invasion of forbs after harvest and site preparation (Boyd *et al.* 1985). In a study by Klingman (1966) perennial asters were found to be susceptible to 2,4-D at 1.12 kg a.e./ha after 2 successive treatments. Lehela (1992, pers. comm.) suggests that large-leaved aster may be controlled for up to 3 years with one application of 2,4-D at a rate of 2.24 kg a.e./ha.

Hexazinone: Rates of 2.0 and 4.0 kg a.i./ha of Pronone® 10G are recommended for controlling asters (United Agri Products nd.). Clean Crop®, Pronone® 5G and 10G may be used for site preparation to control Aster spp. (Anon 1991). Pronone®10G applied in June at 1.5 and 2.0 kg a.i./ha and in September at 2.0 kg a.i./ha significantly reduced percent cover of large-leaved aster (Reynolds *et al.* 1988). Wellman (1986,1987), however, found that Pronone® applied at rates of 1, 2, and 4 kg a.i./ha did not significantly affect large-leaved aster and this species dominated the site following treatment. Corcoran (1991, pers. comm.) noted that large-leaved aster was one of the herbs that seemed to be resistant to Pronone®. It is sensitive to hexazinone in the first year of treatment but reestablishes at a density of 3 to 4 plants/m^2 in the following year. In a greenhouse study, Pronone® 10G applied at 50 to 5000 ppm reduced seed germination at all concentrations (Morash and Freedman 1989).

1.0 to 2.0 kg a.i./ha of Velpar®-L applied in June will control aster for at least 2 years (Reynolds *et al.* 1988). Morash and Freedman (1989) found that Velpar®-L was least toxic to the seedbank, significantly reducing germination only at rates of 5000 ppm, much higher than rates approved for forestry use.

Glyphosate: Frequency of large-leaved aster increased following treatments of glyphosate at rates of 1.12 to 2.24 kg a.i./ha (Perala 1985). Glyphosate was not effective in reducing seed germination in a greenhouse study by Morash and Freedman (1989).

Based on single studies and single application rates it was determined that 2.50, 4.04 and 6.06 kg a.i./ha of Vision® could control large-leaved aster for up to 2 years (Lehela 1992, pers. comm.). These rates are higher than those approved for forestry use in Ontario.

Triclopyr: Seed germination in the laboratory was significantly reduced by triclopyr (Morash and Freedman 1989), but only at rates much higher than those used for forestry purposes. Mercier (1992, pers. comm.) noted that Release® (an ester formulation of triclopyr) was not effective for controlling large-leaved aster except at extremely high rates.

EFFECTS ON CONIFERS

It has been suggested that large-leaved aster may contribute to an environment conducive to jack pine germination and survival following fire (Anon 1970). Brown (1967) found that extracts from this species did not inhibit germination of jack pine seeds. Fisher (1980), however, found that large-leaved aster exhibited allelopathic tendencies by inhibiting germination and early growth of white spruce (*Picea glauca* (Moench) Voss) and black

spruce (*P. mariana* (Mill.) B.S.P.). Extracts from large-leaved aster were reported to inhibit red pine (*Pinus resinosa* Ait.) radical elongation and seedling growth by Norby and Kozlowski (1980). Asters have also shown allelopathic inhibition of black cherry (Horsley 1977). Dense mat-like underground structures compete for moisture and rooting space where this species grows thickly, specifically in cutovers and following release using glyphosate (Perala 1985). Conifer germinants may be smothered by aster foliage.

USES BY WILDLIFE

Both Conners and Timmerman (pers. comm.1992) noted that moose (*Alces alces*) graze on large-leaved aster in the early spring. Woodland caribou (*Caribou tarandus*) also use aster (Bergerud 1972; 1974; 1977). Large-leaved aster is important for cover and as a food source for small mammals and birds (Racey 1992, pers. comm.).

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MNR #5075
(0.5 K P.R., 92 04 24)
ISSN # 0846-6106

Northwestern Ontario Forest Technology Development Unit
Ontario Ministry of Natural Resources
25th Side Road, R. R. #1, Thunder Bay, Ontario, Canada P7C 4T9
Phone: (807) 939-2501 Facsimile: (807) 939-1918

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